Farmington Bay Nutrient Study

Update

American Water Resources Association

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Utah Division of Water Quality

Beneficial Uses

Shorebirds and Waterfowl

(~750,000 hatchlings per year)

Recreation

Aquatic Life

One eared grebe eats more that 15,000 Shrimp per day

Cysts are commercially harvested (~20 million pounds per year)

NEEDS

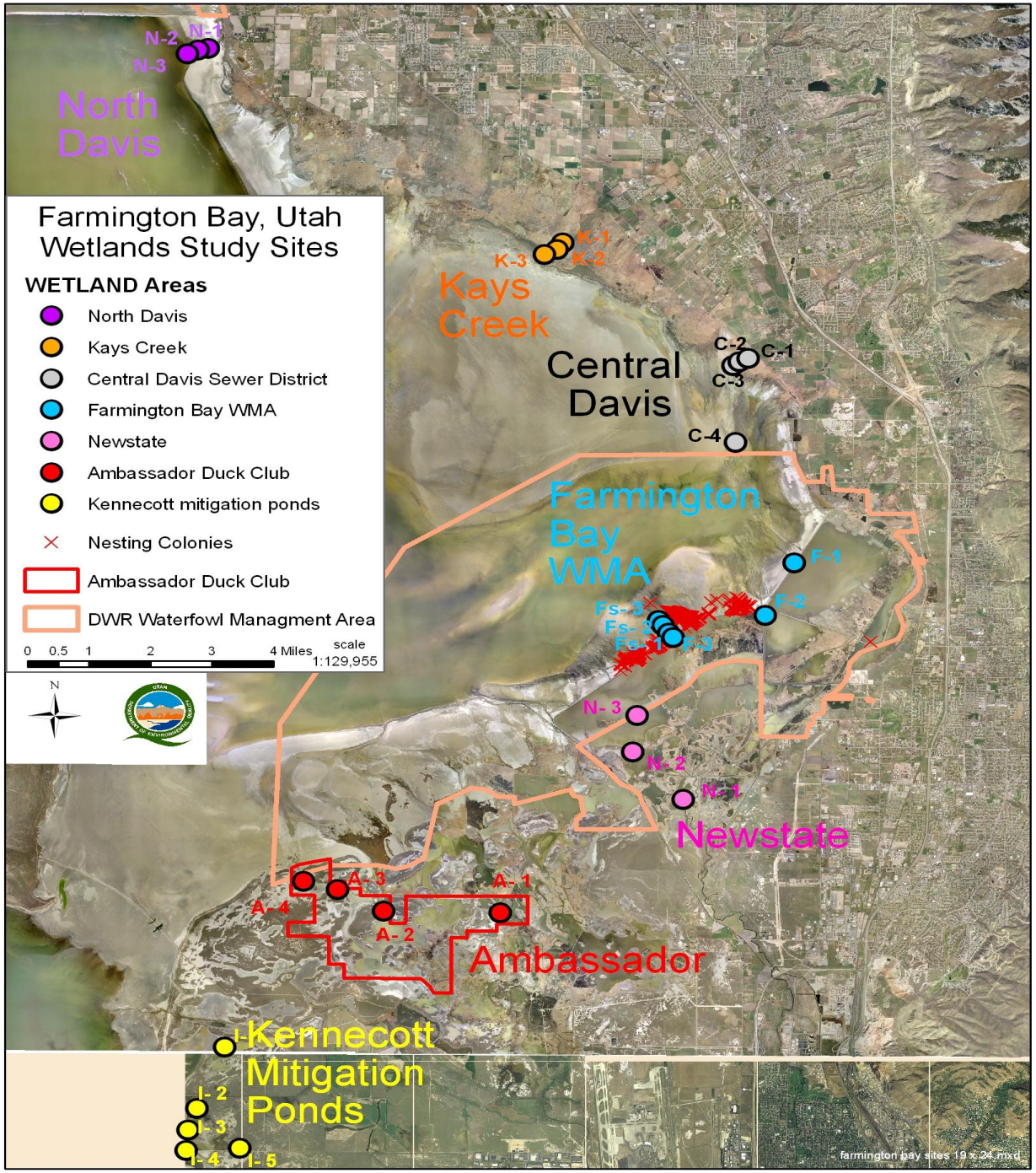
DEVELOP APPROPRIATE METHODOLOGY FOR SITE-SPECIFIC NUTRIENT CRITERIA AND ASSOCIATED METHODOLOGY FOR BENEFICIAL USE ASSESSMENT

APPROACH

- **UNDERSTAND "HOW THE ECOSYSTEM WORKS"**
- **IDENTIFY SENSITIVE HABITAT, SEASON AND FOODCHAIN LINKS**
- **IDENTIFY (TOLERANCE) THRESHOLDS AMONG IMPORTANT ECOSYSTEM COMPONENTS**

1988

2002


Farmington Bay, Utah
Wetlands Study Sites
WETLAND Areas
North Davis
Kays Creek
Central Davis Sewer District
Farmington Bay WMA
Newstate
Ambassador Duck Club
Kennecott mitigation ponds
Nesting Colonies
Ambassador Duck Club
DWR Waterfowl Managment Area
0 0.5 1 2 3 4 Miles
scale 1:129,955
N
North Davis
N-1
N-2
N-3
Kays Creek
K-1
K-2
K-3
Central Davis
C-1
C-2
C-3
C-4
Farmington Bay WMA
F-1
F-2
F-3
Fs-1
Fs-2
Fs-3
Newstate
N-1
N-2
N-3
Ambassador
A-1
A-2
A-3
A-4
Kennecott Mitigation Ponds
I-2
I-3
I-4
I-5
farmington bay sites 19 x 24.mxd

Sheetflow Habitats

Impounded Habitats

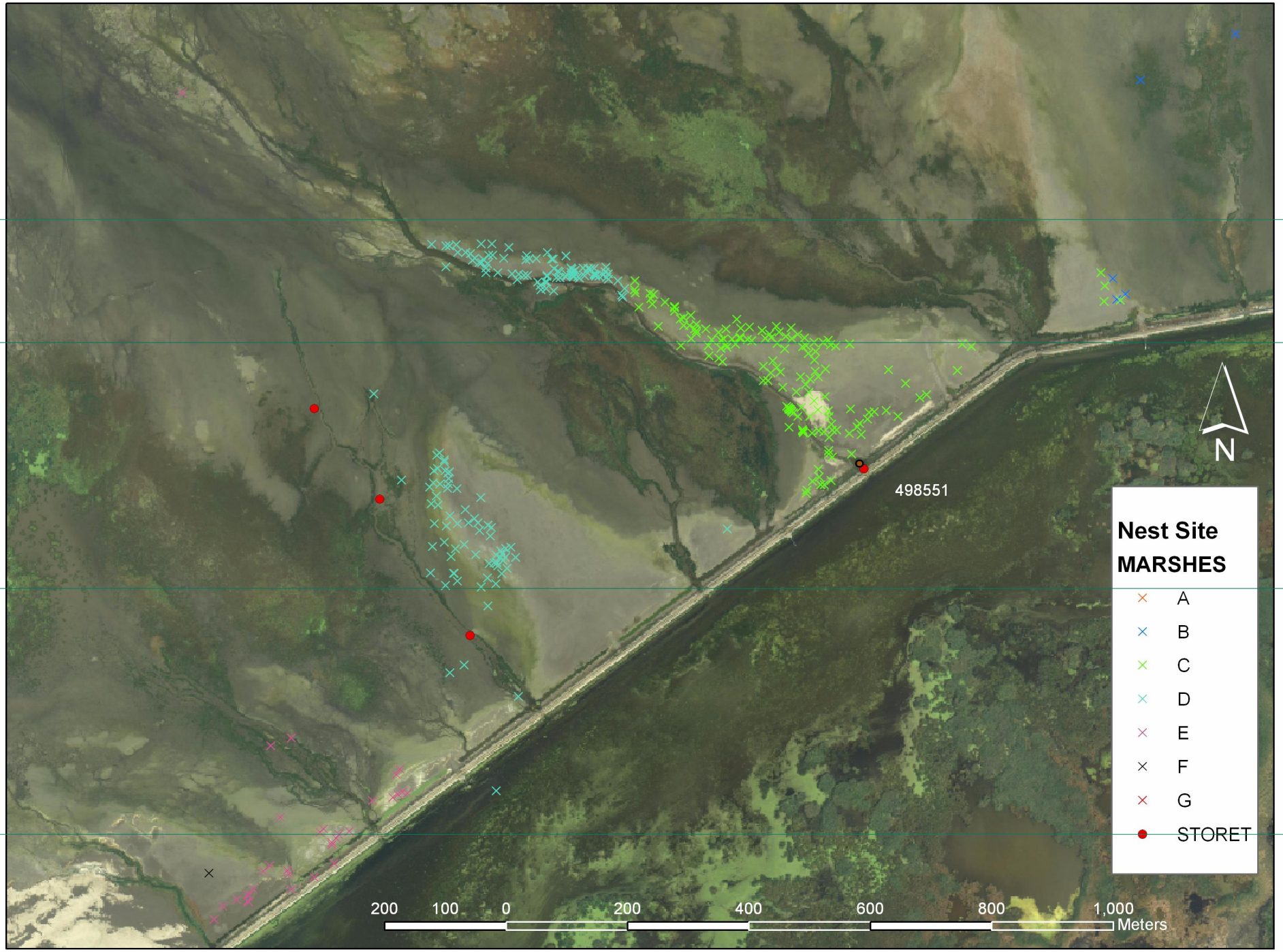
Shorebird Study Objectives

-Nesting habitat

-Nesting Success

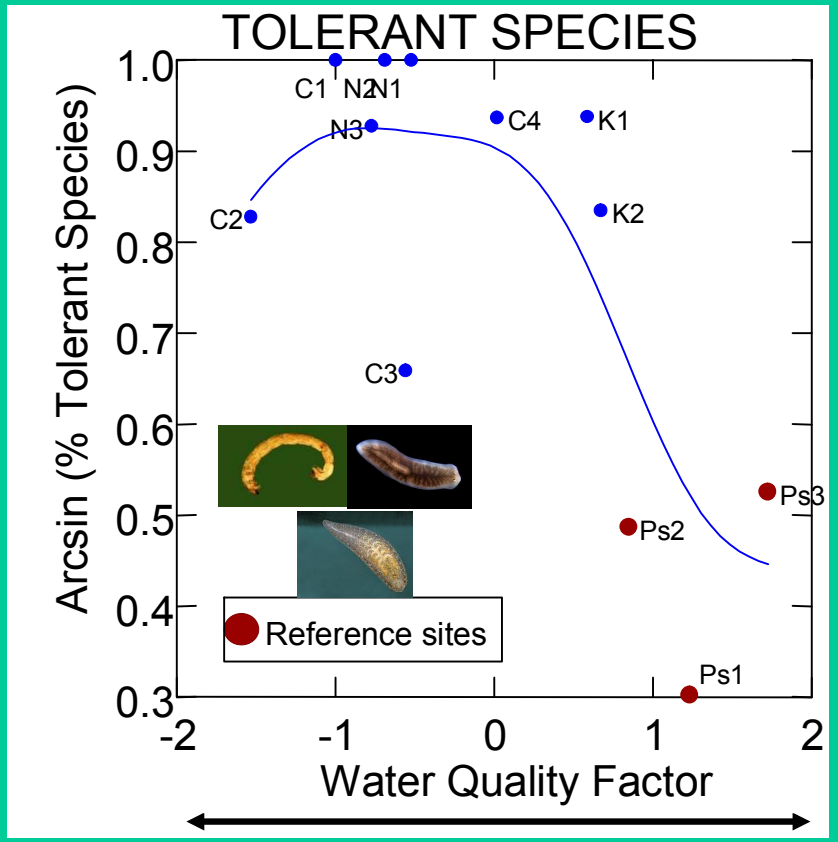
-Hatching success

-Aquatic life in their food chain


N
498551
Nest Site
MARSHES
A
B
C
D
E
F
G
STORET
200 100 0 200 400 600 800 1,000
Meters

Tolerant & Sensitive Macroinvertebrates (2004)

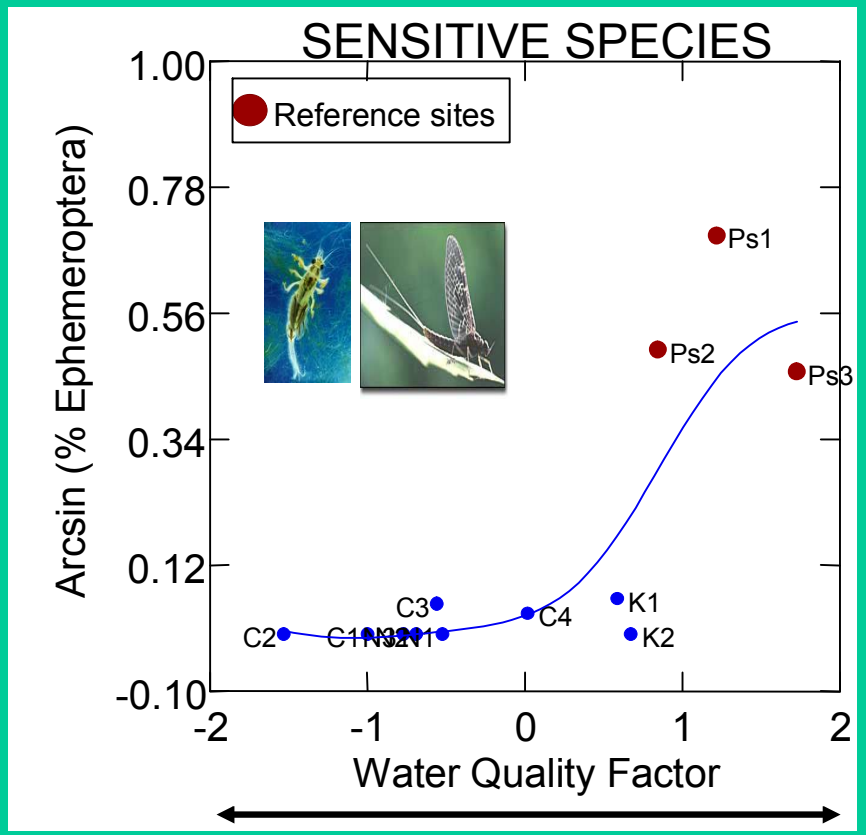
Sheetflow Sites



Increasing Nutrients (Total N and P)

Increasing pH, Dissolved Oxygen and TDS

Tolerant species were more abundant at eutrophic sites

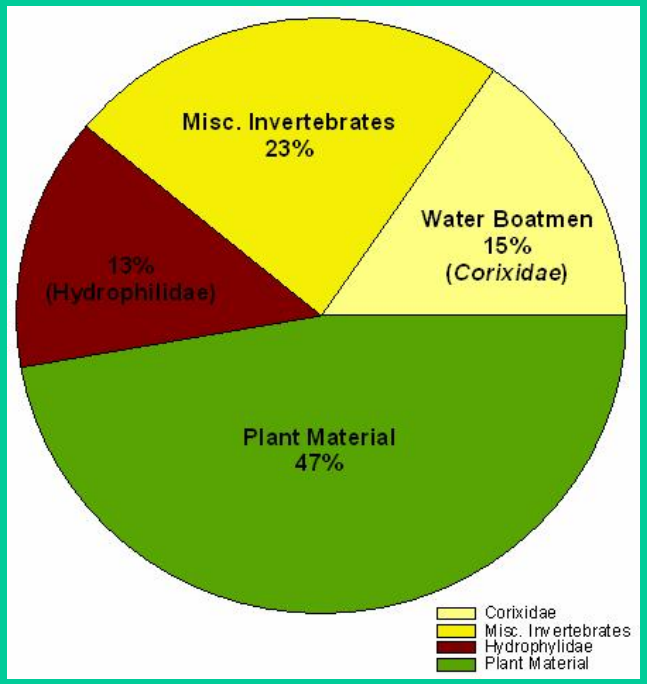


Increasing Nutrients (Total N and P)

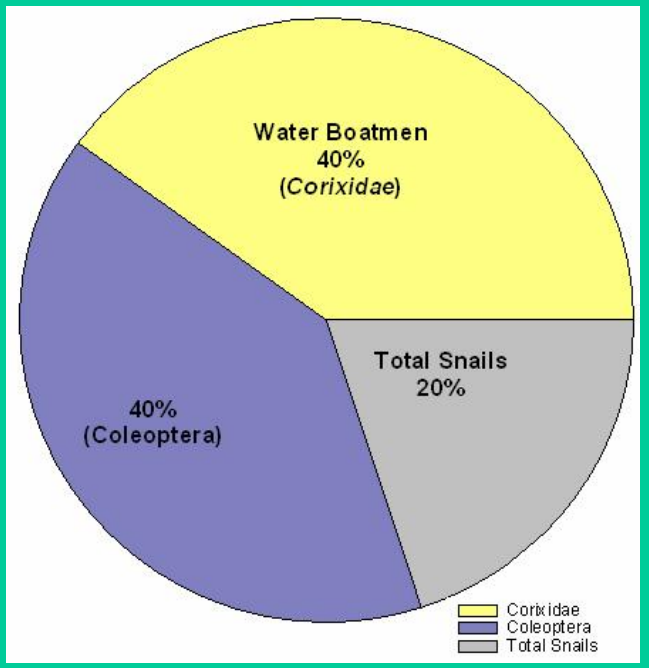
Increasing pH, Dissolved Oxygen and TDS

Sensitive species were more abundant at oligotrophic sites, (e.g. reference sites)

Kays Creek (south)
Stomach contents by volume

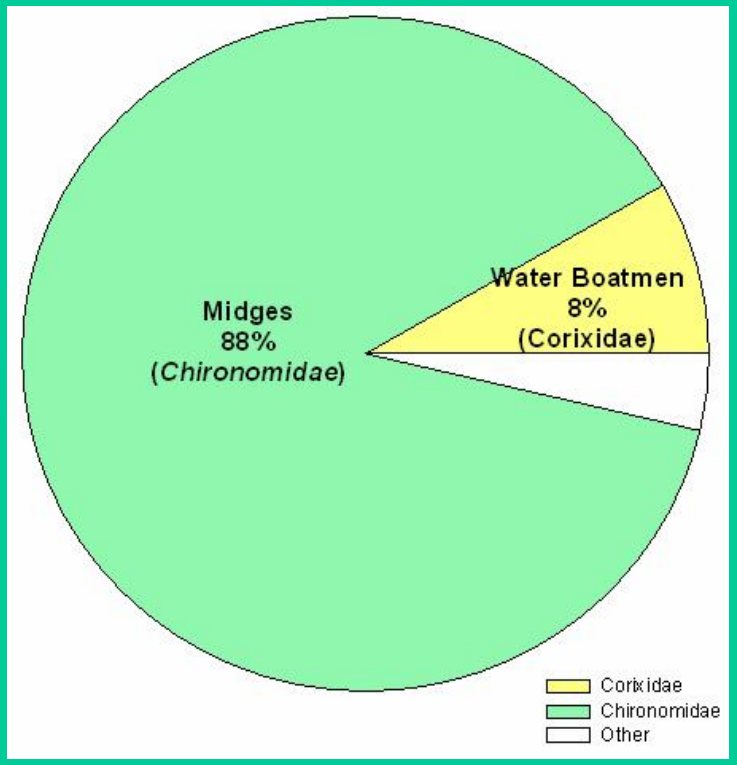


American avocet

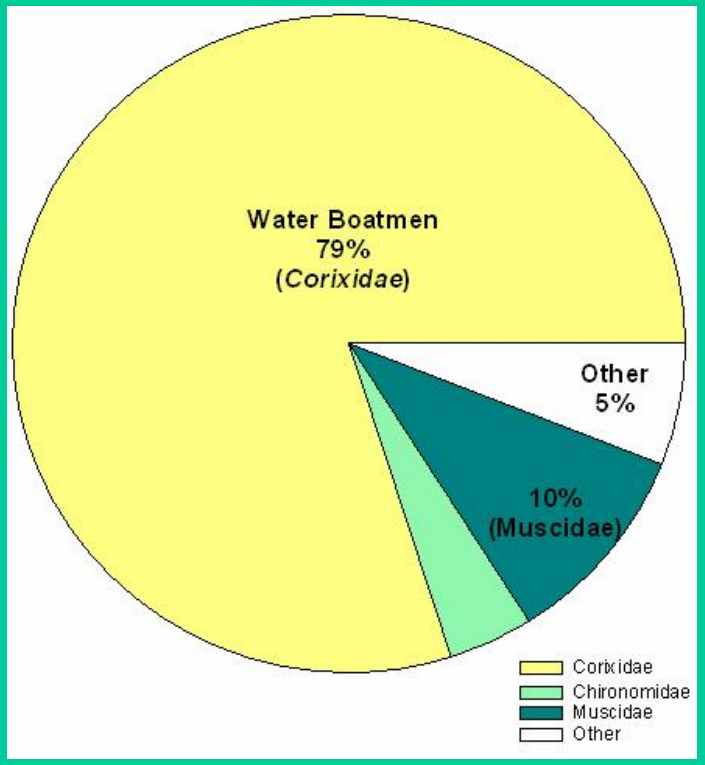


Black neck stilt

Bear River Bird Refuge
Stomach contents by volume



American avocet

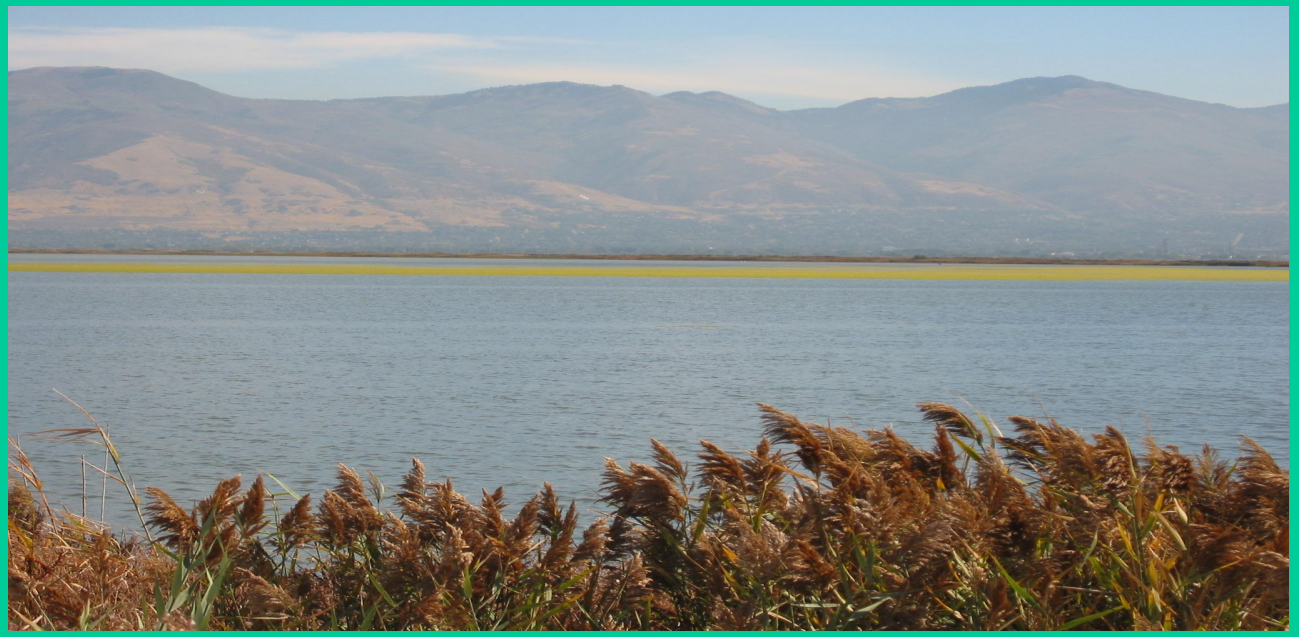


black neck stilt

Nesting and Hatching Success

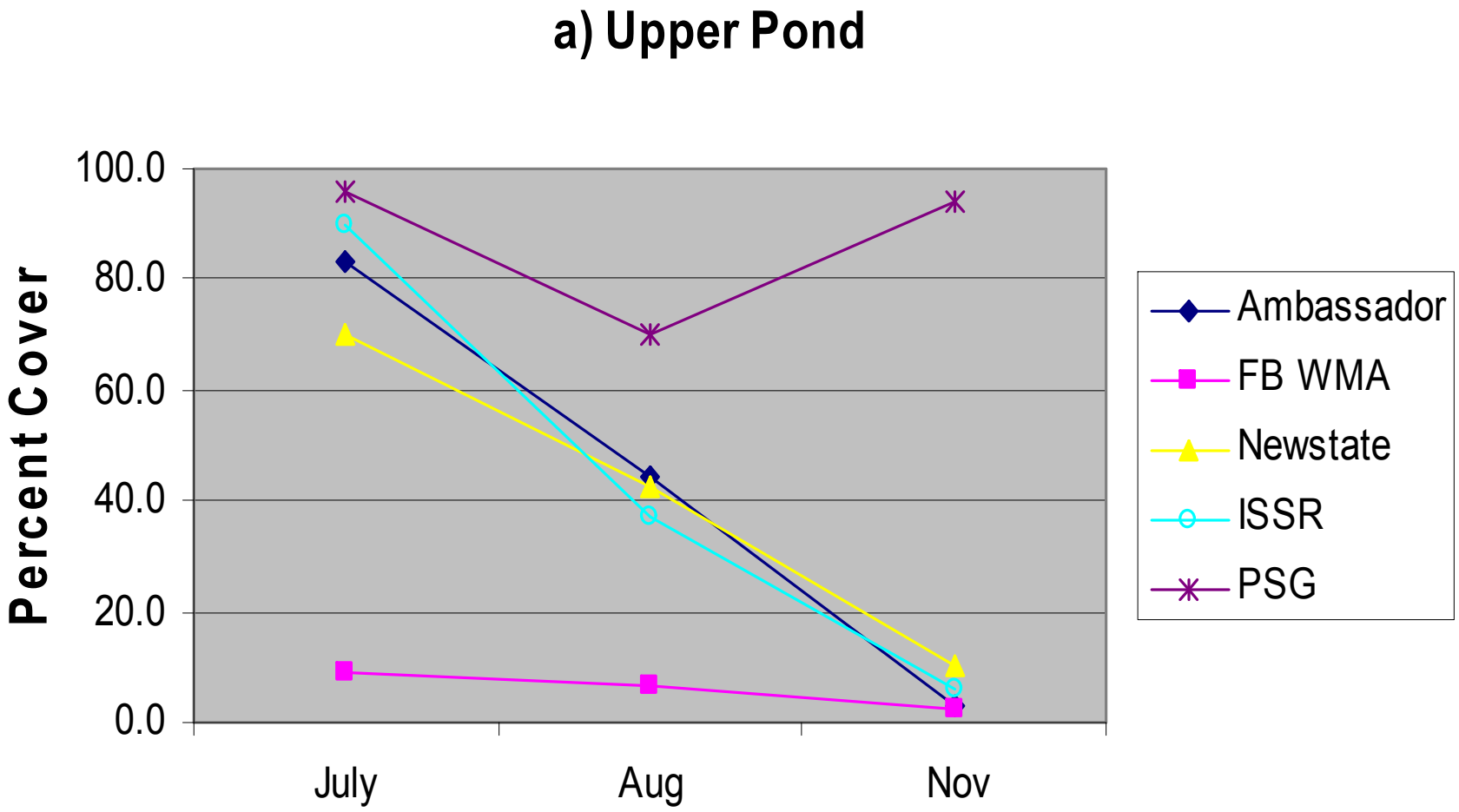
Site	Year	Species	Total Eggs Laid (total nests)	Clutch Size (n)	Hatchability (n)	Total Young Produced (average # eggs hatched / nest)	# Young Leaving/Nest (n)
FARM	**2005**						
		AMAV	**1681 (481)**	**3.86 ± 0.51 (247)**	**0.96 ± 0.13 (247)**	**914 (1.9)**	**3.75 ± 0.57 (247)**
		BNST	**769 (411)**	**3.87 ± 0.48 (201)**	**0.97 ± 0.11 (201)**	**737 (1.79)**	**3.76 ± 0.62 (201)**
	2006						
		AMAV	**2146 (641)**	**3.93 ± 0.30 (413)**	**0.93 ± 0.15 (369)**	**1538 (2.4)**	**3.55 ± (435)**
		BNST	**1123 (313)**	**3.97 ± 0.21 (232)**	**0.96 ± 0.12 (221)**	**916 (2.9)**	**3.77 ± (243)**

Impoundments
2004 Conclusion



- Analytical method shows general trends and relationships, however, we need a more sensitive tool to make the link between ecological function and beneficial use.

2005 Seasonal Percent Cover



Remaining Data Gaps (Wetlands)

- Determine relative importance of shading, waterfowl foraging, carp foraging and potential stress from excess P in the impoundments.

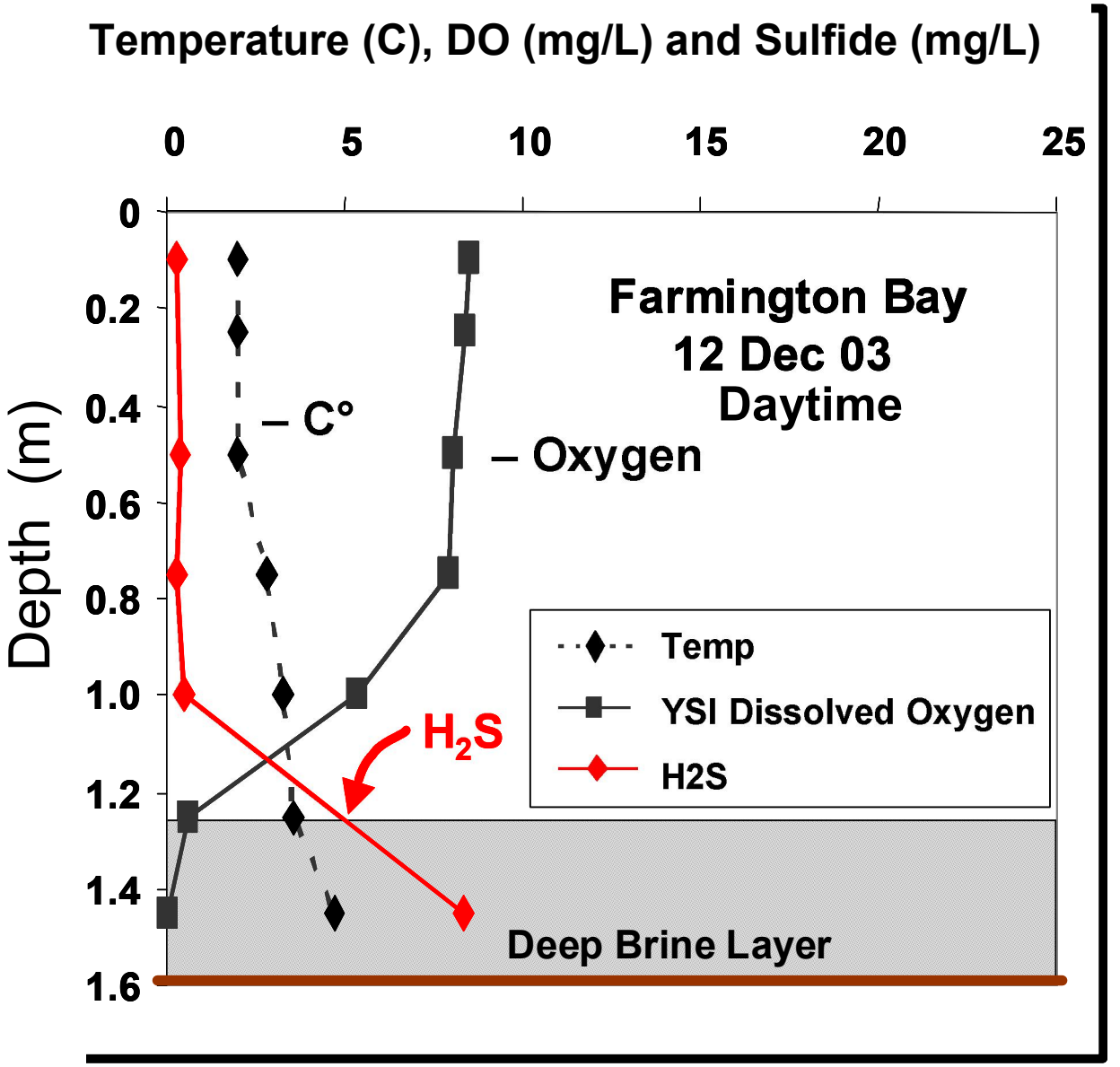
- Quantify nesting habitat characteristics in terms of plant communities and proximity to water.

- Quantify shorebird juvenile survivability and link this to habitat and food resource requirements.

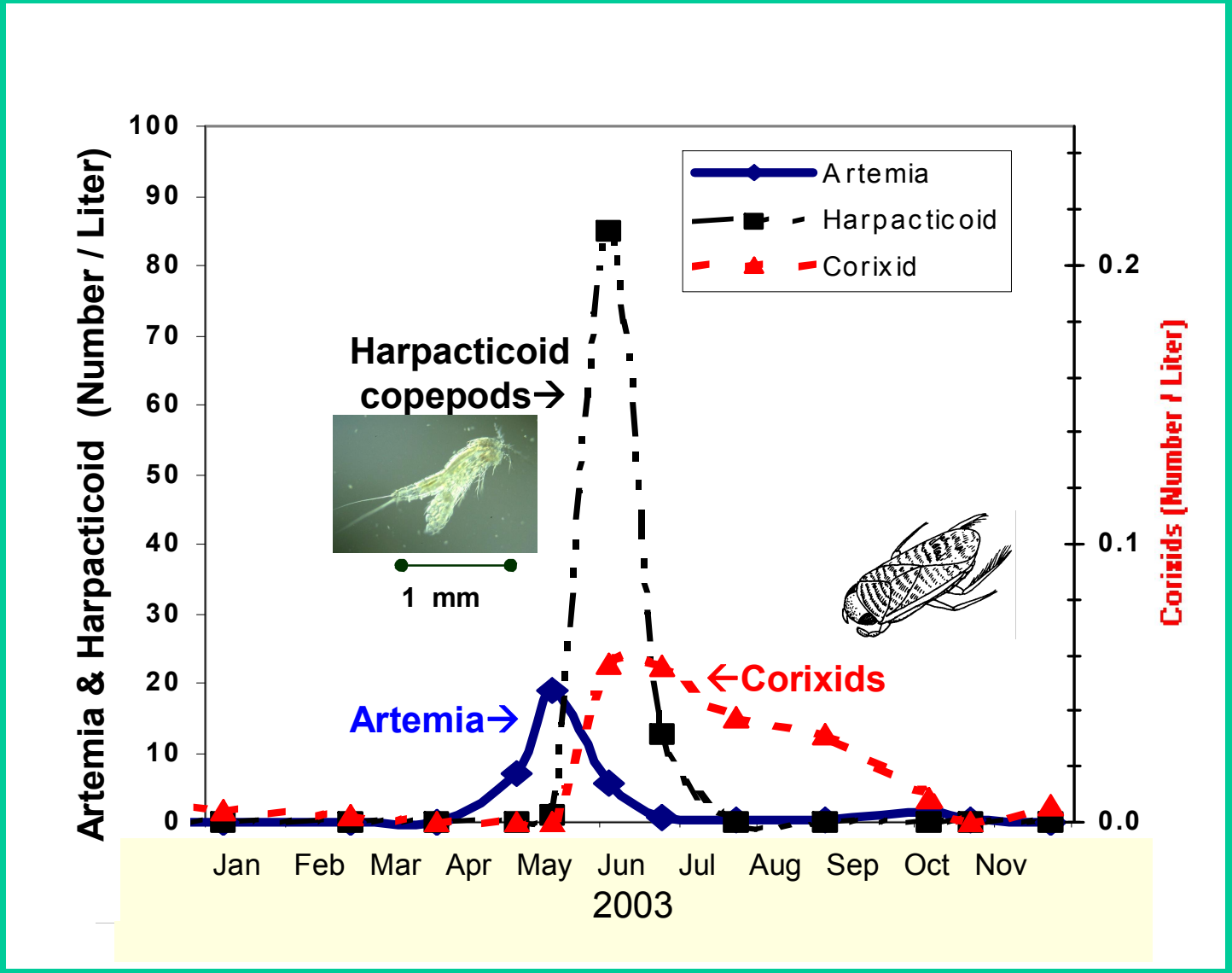
Nutrient Loading to Farmington Bay

Water Quality

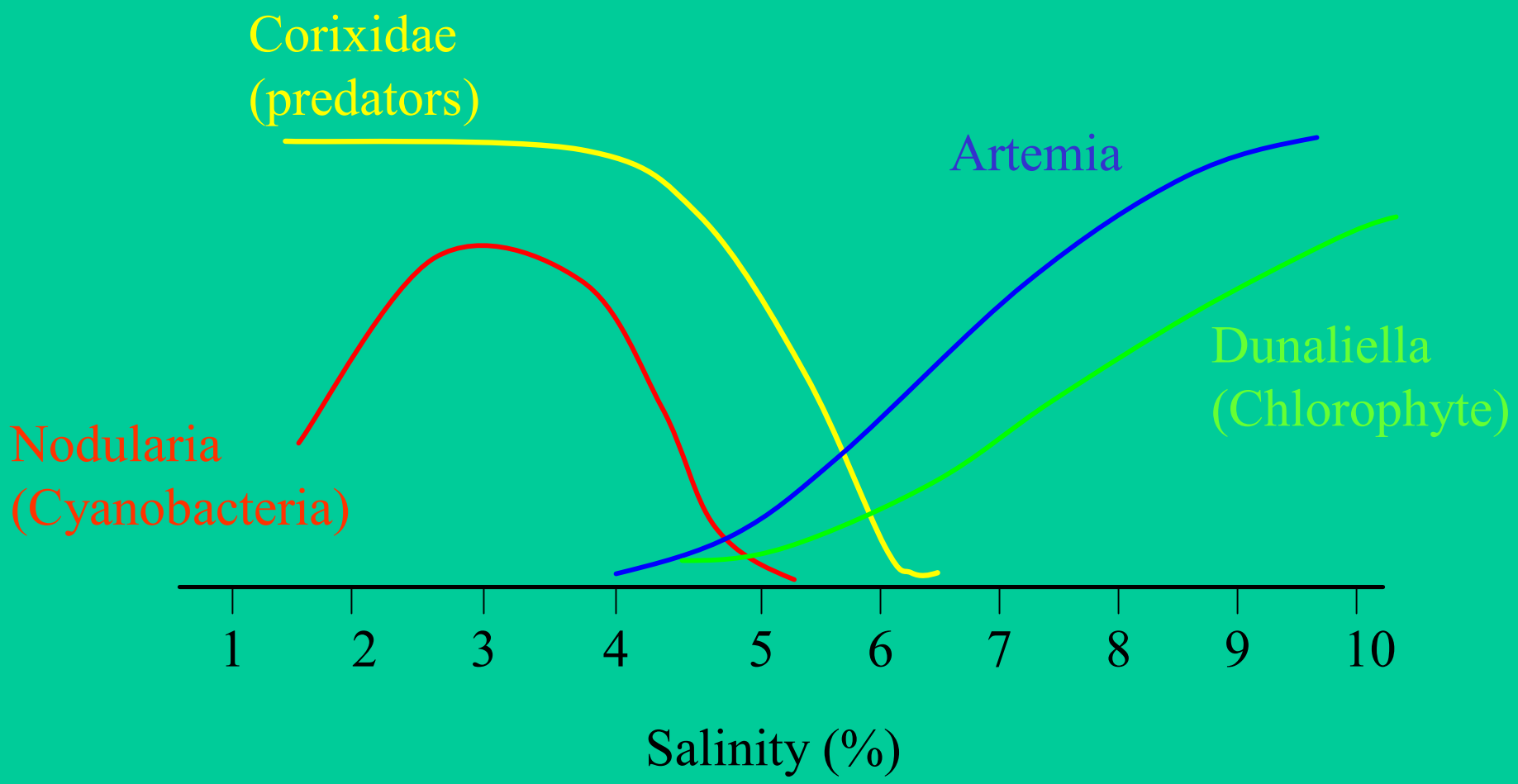
Oxygen and H_2S Conditions



Another hypothesis for the decline of brine shrimp: Invertebrate Predation



Farmington Bay Open Water



Farmington Bay Open Water
Data Gaps

1. Ascertain causes for low Artemia and Ephydra populations
   Water quality (H_2S, Low DO, cyanotoxins)
   vs Predation
   vs Salinity (failure to thrive at low salinity)

2. Cyanotoxin toxicity to other wildlife

3. Palatability of Nodularia to brine shrimp?
   (nitrogen fixed in Farmington Bay is assimilated by brine shrimp in Gilbert Bay)